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[54] **TRUCK COVER**

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[52] **U.S. Cl.** **296/100; 296/98**

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160/67, 68, 69, 71, 72, 78, 80

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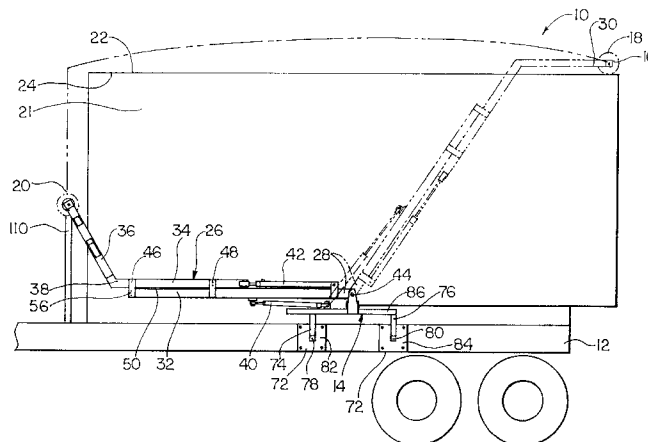
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[57] **ABSTRACT**

For a truck having an upwardly open container and a support structure, a truck cover system is securable to the support structure and capable of drawing a flexible cover over the container. In an exemplary embodiment, the truck cover system includes a pair of nonlinear arms, movable in unison from a first position to a second position. Each of the arms includes an elongate base member slidably engaged with an elongate extension member wherein the extension member has a first elongate portion disposed at an obtuse angle with respect to a second elongate portion, the second elongate portion of the extension member being substantially parallel, noncoaxial, and in slidable engagement with the base member. The first elongate portion of the extension member is secured to the first end of the flexible cover. The truck cover system further includes first and second actuators associated with each of the nonlinear arms to move the arms from the first position to the second position.

20 Claims, 6 Drawing Sheets



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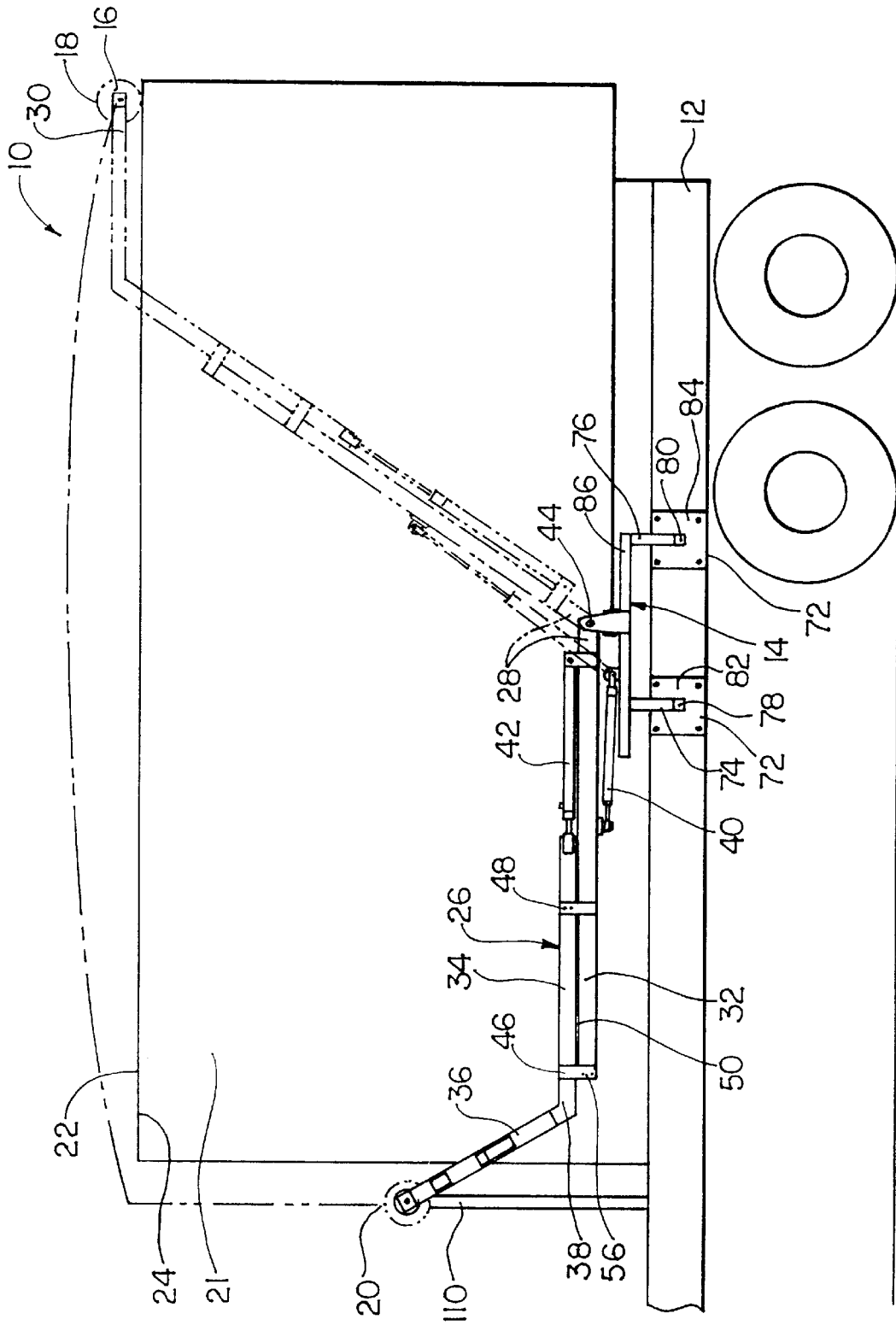


FIG. 1

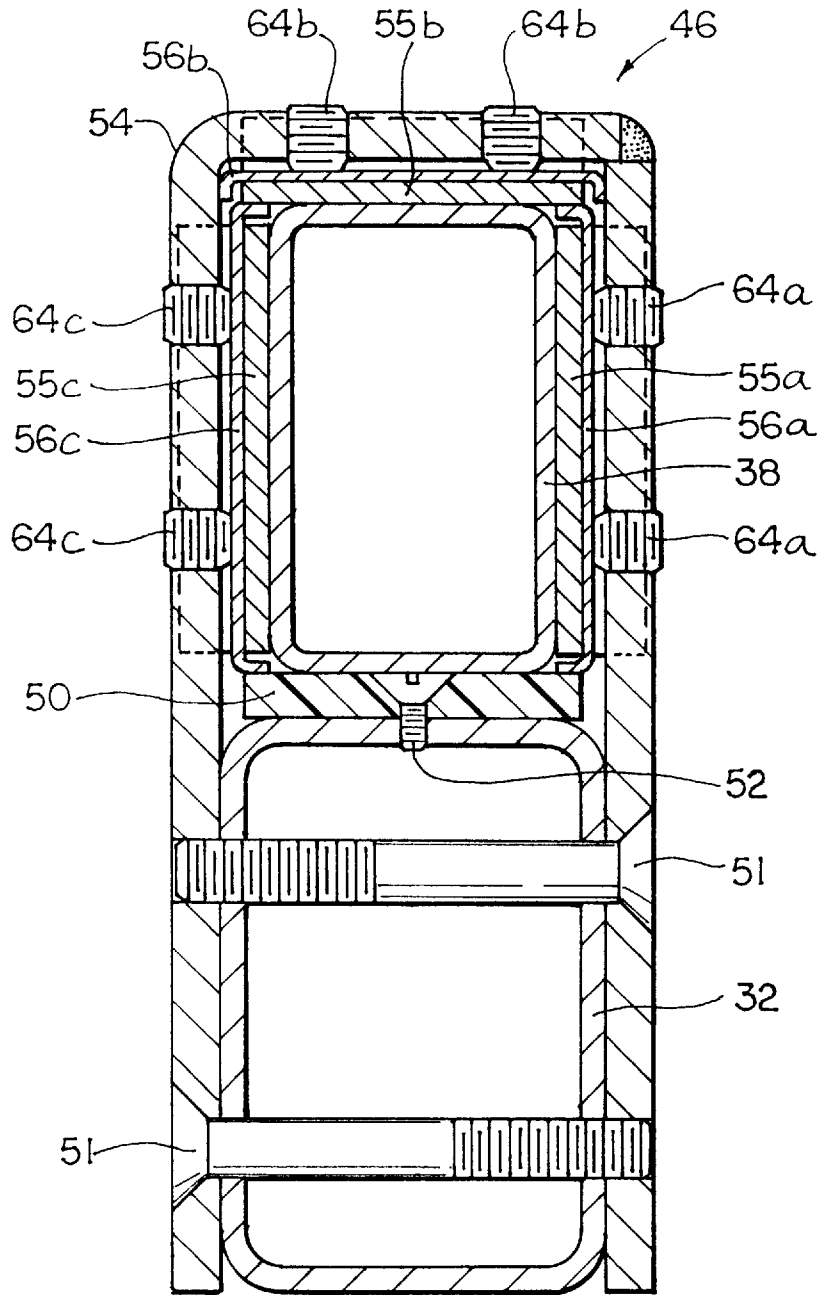


FIG. 3

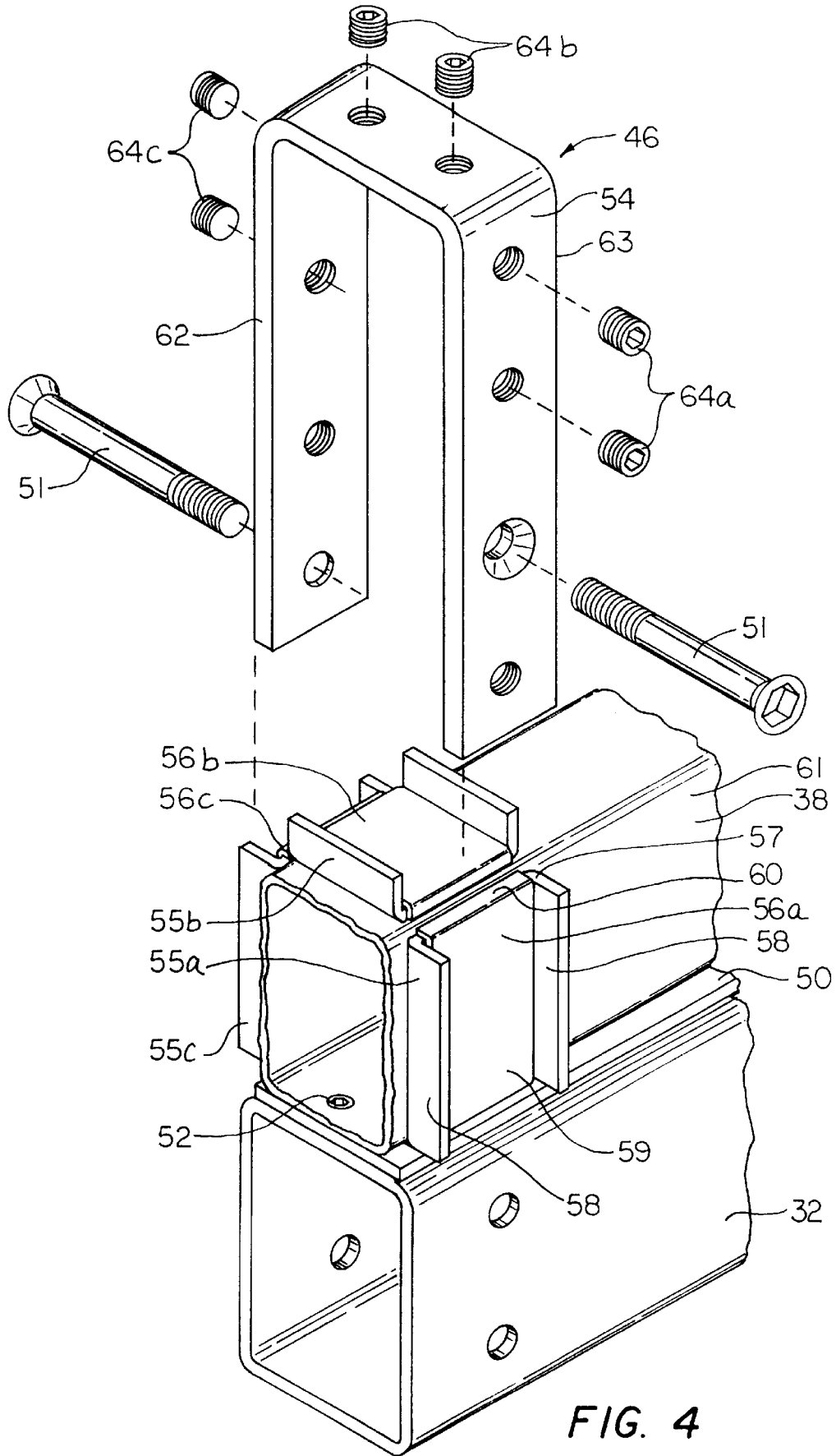


FIG. 4

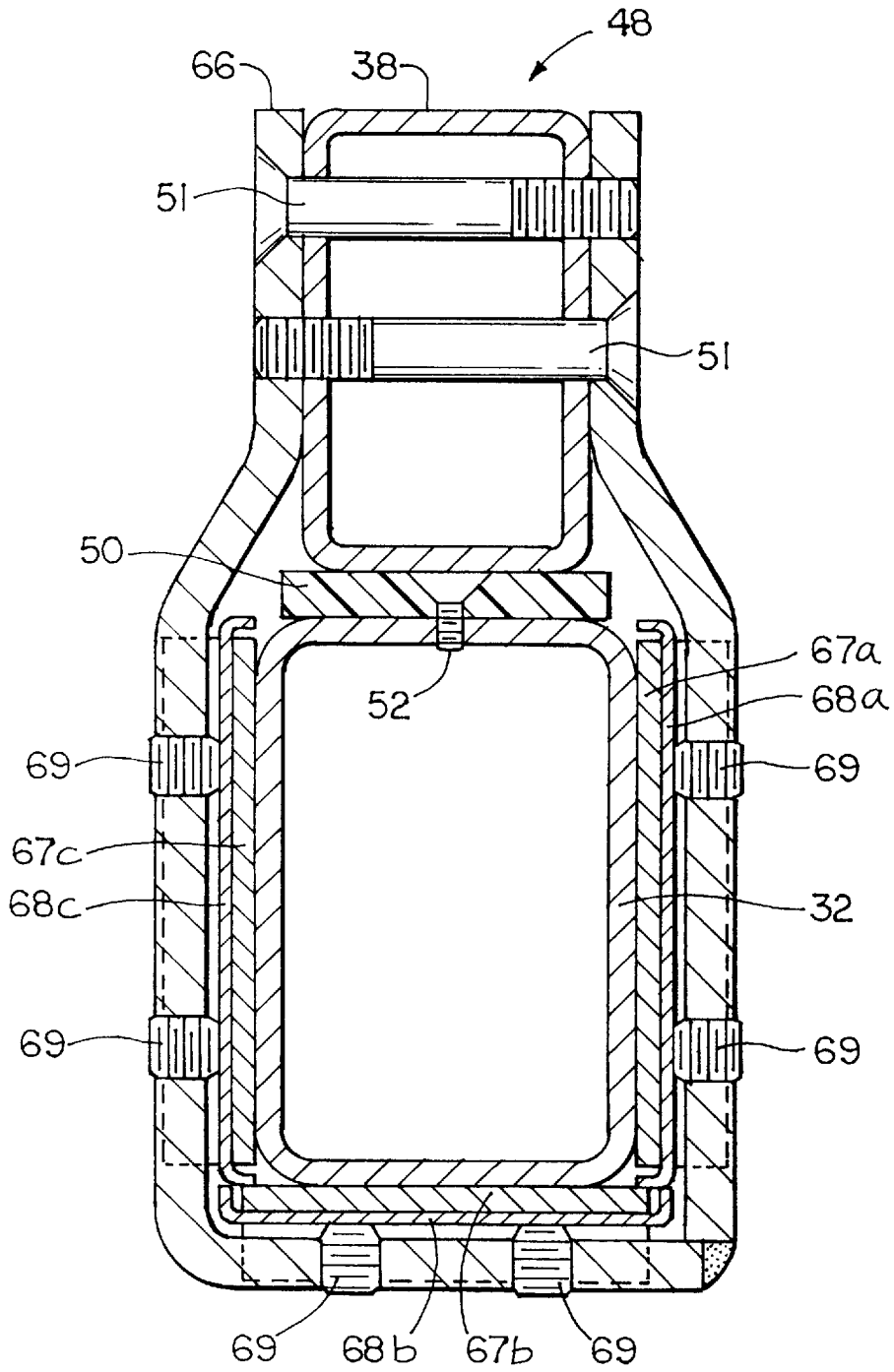


FIG. 5

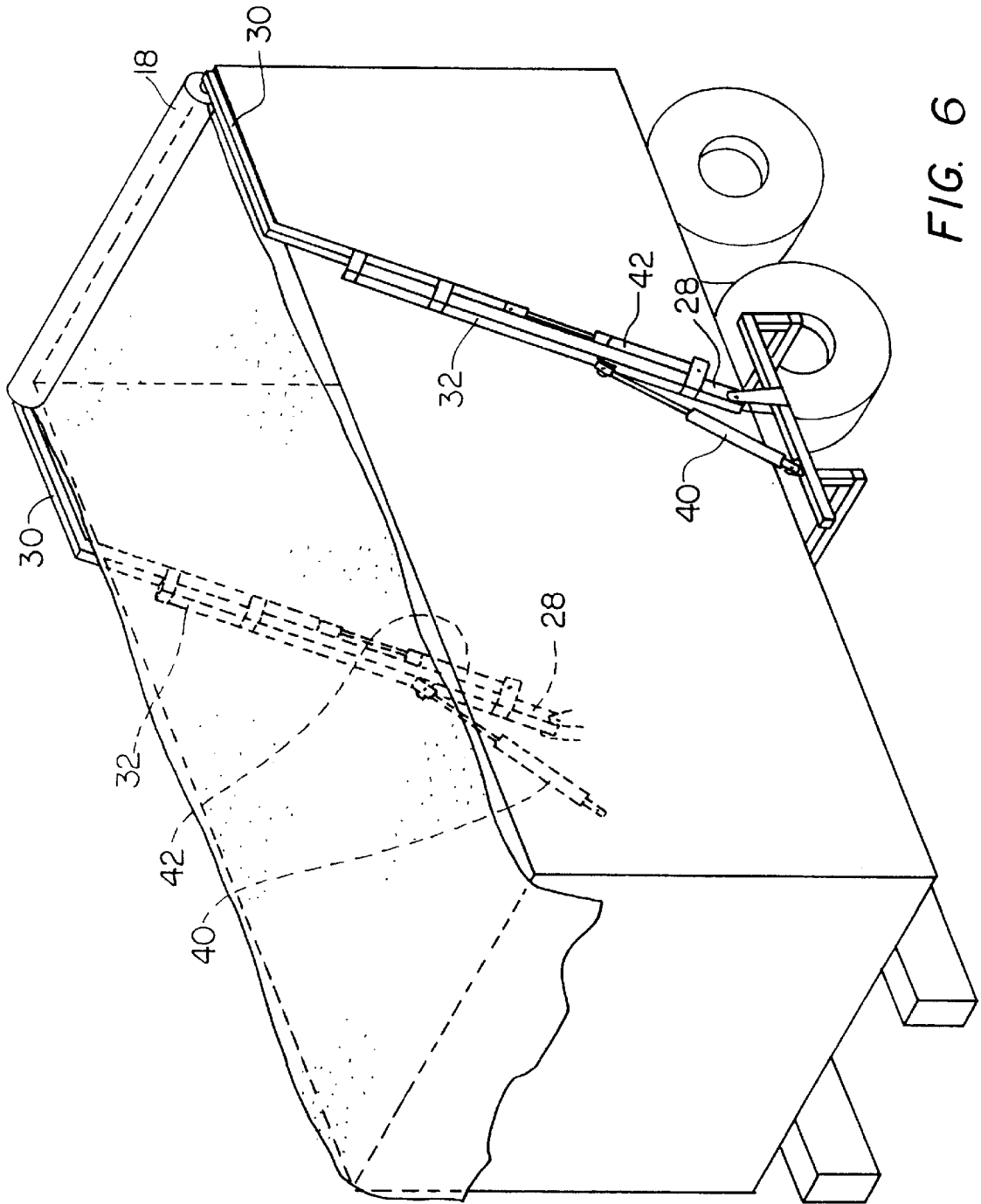


FIG. 6

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TRUCK COVER

FIELD OF THE INVENTION

The present invention relates to truck cover systems, and more particularly to a truck cover system for maintaining a cover in close proximity to a container.

BACKGROUND OF THE INVENTION

Flexible covers are placed over open truck-borne containers for many reasons including protection of the contents of the container and prevention of the contents from being blown out of the container while the truck is in transit. Although containers can be covered by manually operated cover mechanisms, mechanical devices are known that assist in positioning a cover over an open truck container.

One type of mechanical covering device includes telescopic arms comprising two nested arm segments that are extended or retracted by piston-like actuators as the arms are pivoted fore and aft to pull a cover over or retract a cover from the top of a container. The nested arm segments, however, must remain relatively straight and undented to telescope properly and not bind. When damaged, this type of telescopic arm is not readily useable or repairable.

SUMMARY OF THE INVENTION

In accordance with the invention, a truck cover system is provided that is durable and easily maintained. The truck cover system is securable to a support structure and includes a pair of arms which move from a first position to a second position to draw a flexible cover over an upwardly open container having an opening defined by an upper edge.

In an exemplary embodiment, the truck cover system includes a pair of nonlinear arms, movable in unison from a first position to a second position. Each of the arms includes an elongate base member slidably engaged with an elongate extension member wherein the extension member has a first elongate portion disposed at an obtuse angle with respect to a second elongate portion. The second elongate portion of the extension member is substantially parallel, noncoaxial, and in slidable engagement with the base member. The first elongate portion of the extension member is secured to a first end of the flexible cover. The truck cover system further includes first and second actuators associated with each of the nonlinear arms to move the arm from the first position to the second position.

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the invention will be apparent from the following detailed description of the invention in conjunction with the accompanying drawings, in which:

FIG. 1 is a side view of a truck cover system illustrating arm movement to cover a truck container;

FIG. 2 is detailed view of arm elements of the truck cover system of FIG. 1;

FIG. 3 is a front sectional view of a first retainer;

FIG. 4 is a perspective partially exploded view of the first retainer of FIG. 3.

FIG. 5 is a front sectional view of a second retainer.

FIG. 6 is a view of the truck cover system illustrating both arms of the apparatus.

DETAILED DESCRIPTION

FIG. 1 and FIG. 6 illustrate a durable and easily maintainable truck cover system. The truck cover system includes

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arms which provide easy visual and mechanical access to system components for rapid inspection and replacement thereof. The arms are extendable to enable containers of different sizes to be covered, as well as to control a travel path for a flexible cover. The structure of the arms allows long and short containers to be completely covered. Also, the arms may be adjusted to accommodate some arm and container distortion. It will be appreciated that the arms may be linear or nonlinear.

FIGS. 1 and 2 illustrate a truck cover system 10 secured to a truck frame 12 by a support structure 14. The device is symmetrical, therefore for simplicity sake, only a single side is shown in the drawings, though it should be understood that the other side contains similar structure and operates in a similar manner. The truck cover system 10 is capable of drawing a flexible cover 16 having a first end 18 and a second end 20 over a container 21 having an opening 22 defined by an upper edge 24 of the container. The truck cover system 10 includes a pair of nonlinear arms 26 each having a first end 28 engaged with the support structure 14 and a second end 30 secured to the first end 18 of the cover 16. It will be appreciated that the word "end", as used herein, refers to a general vicinity and not a precise location. The arms 26 each include an elongate base member 32 slidably engaged with an elongate extension member 34. The extension member 34 includes a first elongate portion 36 disposed at an obtuse angle with respect to a second elongate portion 38. The base member 32 and the extension member second portion 38 are slidably engaged in a parallel, noncoaxial arrangement with a slide strip 50 disposed therebetween. The base member 32 and extension member 34 are each rigid and resistant to deformation thus providing a durable mechanism for covering a truck container opening 22. The base and extension members 32,34 can be solid or hollow, but as will be appreciated, in comparison with telescoping segments which require minimal wall thickness to accommodate sequential overlapping segments and therefore limited damage resistance, hollow base and extension member wall thicknesses can be made significantly thicker. Also, as the slidable relationship between the base member 32 and extension member 34 is adjustable as discussed below, the arms 26 can withstand some distortion of the arm and also of the container 21.

In an exemplary embodiment, each of the arms 26 includes a first actuator 40 linking the support structure 14 to the base member 32 and a second actuator 42 linking the base member 32 and the extension member 34. The first and second actuators 40,42 move the arms 26 in unison from a first position to a second position. The arms 26 are pivotally secured at respective arm pivot points 44 and caused to pivot about the arm pivot points by the first actuator 40 and are extended and retracted by the second actuator 42. The supporting structure 14 is affixed to the truck frame 12 for supporting the arms 26, thus not using space required by a structure secured to a truck bed. The arms 26 are adapted to maintain the cover 16 in close proximity to the container upper edge 24 as the cover 16 covers the container 21. The container 21 shown is a roll-off container, but other containers having an opening defined by an upper edge may be covered as well.

The arms 26 further include a first retainer 46 and a second retainer 48 for maintaining the base member 32 and the extension member second portion 38 slidably engaged. The first retainer 46 and the second retainer 48 are adjustable to accommodate arms of differing size. Arms formed from tubing, such as steel tubing, may have relatively loose dimensional tolerances. Thus, each order of tubing may have

varying actual dimensions. The adjustable first and second retainers **46,48** allow base and extension members **32,34** of varying size to be movably confined, while providing appropriate tension for proper extension of the arm **26**. This configuration also allows an operator to view the arm components more easily than in a traditional telescoping arm configuration.

As shown in FIGS. **3** and **4**, the first retainer **46** is secured to the base member **32** by retainer bolts **51** and the slide strip **50** is affixed to the base member **32** by slide strip screws **52**. Other means known to one skilled in the art may be used to secure the slide strip or retainers such as welding, bonding, or glue.

The first retainer **46** includes a bracket **54**, channels **55a-c**, and corresponding back-up plates **56a-c**. The channel **55a** includes a channel base portion **57** and opposing channel side portions **58** substantially perpendicular to the base portion. The back-up plate **56a** includes a back-up base portion **59** and opposing back-up plate side portions **60**. The channel side portions **58** and back-up plate side portions **60** are arranged so that the channel base portion **57** abuts the back-up plate base portion **59**. The channel base portion **57** confronts a first surface **61** of the extension arm second portion **38**. The channel side portions **58** extend to edges of first and second faces **62,63** of the bracket **54**. The back-up plate side portions **60** conform to the height of the channel base portion **57**, thus capturing the channel **55a** and back-up plate **56a** within the first retainer **46**. The channel **55a** and the back-up plate **56a** are "U"-shaped in this embodiment, as shown in FIG. **4**.

Set screws **64a** impinge upon the back-up plate **56a** to increase a pressure applied to the extension member second portion **38** by the channel **55a**. The set screws **64a** are used to adjust the pressure thereby varying the force required to move the extension member **34** with respect to the base member **32**. This arrangement accommodates arms of differing dimensions.

Similarly, channels **55b,55c** are joined with a respective back-up plate **56b,56c**, and held captive within the first retainer **46**. The back-up plates **56b,56c** are manipulated by set screws **64b-c**. The channels **55a-c** and the slide strip **50** surround a portion of the extension member second portion **38** to maintain the slidable engagement of the base member **32** and the extension member **34**.

As shown the base member **32** is wider than the extension member **34**, but other embodiments are contemplated wherein the base member width or height is equal to or larger than the extension member width or height, with the first and second retainers shaped in conformance therewith. It will also be appreciated that the base or extension members may be of a shape other than rectangular, circular for example, without departing from the spirit of the invention.

Referring now to FIG. **5**, the second retainer **48** similarly includes a bracket **66** shaped to conform to the base member **32** and the extension member second portion **38** widths, wherein the second retainer **48** is affixed to the extension member by retainer bolts **51**. The second retainer **48** includes channels **67a-c** which are mated with a corresponding back-up plate **68a-c** and held captive within the second retainer. Set screws **69** impinge upon the back-up plates **68a-c** to adjust a pressure applied to the base member **32** wherein the sides of the base member are surrounded by respective channels **67a-c** and slide strip **50**.

The slide strip **50** and channels **55a-c** are formed from an Ultra High Molecular Weight (UHMW) material such as polyethylene which allows relatively unencumbered axial

movement of the extension member **34** with respect to the base portion **32**. This arrangement obviates the need for regular lubrication as is necessary for telescoping arms, a messy and environmentally less desirable situation. The slide strip **50** is rectangular in shape in the preferred embodiment, but is not limited thereto. A slide strip can include a series of UHMW portions disposed lengthwise with respect to the arm, or horizontally. Other configurations are contemplated to be within the scope and spirit of the invention. It will also be appreciated that other suitable materials known in the art to provide the desired durability and frictional resistance may be used.

In the exemplary embodiment of FIGS. **1** and **2**, the supporting structure **14** is secured to the truck frame **12** at two attachment points **72**, on each side of the truck frame. The supporting structure **14** includes first and second vertical beams **74,76** and associated horizontal beams **78,80** extending from respective base portions **82,84** which are affixed to the truck frame **12** at the two attachment points **72**. The first and second vertical beams **74,76** are affixed to a support beam **86**. Also affixed to the support beam **86** is a first post **88** having a pivot point **92** and a second post **90**. The supporting structure **14** further includes a yoke **94** secured to the supporting beam **86**. The supporting structure **14** configuration provides a solid foundation to which the arms **26** are attached, and does not use any space that may be needed by a container. The supporting structure **14** can be removably attached to the truck frame **12** allowing the entire truck cover system **10** to be removed or attached in a different location on the truck frame.

The first actuator **40** for causing the arms **26** to pivot includes a first hydraulic cylinder **94** in an exemplary embodiment, but is not limited thereto. For example, servomotors, pneumatic systems, or other means known to one skilled in the art may be used. The first cylinder **94** includes a first end **96** affixed to the base member **32** at a first point **98**, and a second end **100** pivotally attached to the first post pivot point **92**. The second activator **42** includes a second cylinder **102** having a first end **104** affixed to the extension member **34** and a second end **106** pivotally secured to a support post **108** which is affixed to the base member **32**. In an exemplary embodiment, the first cylinder **94** has a stroke of about twenty-four inches to accommodate the required range of motion from the first position to the second position. The second cylinder **102** for extending and retracting the arms has a stroke of about thirty inches. As can be seen, the second cylinder **102** operates to provide axial movement of the extension member second portion **38** with respect to the base member **32**. Movement of the arms **26** as a whole does not affect the relationship of the base member **32** with respect to the extension member **34**, since the second cylinder **102** is affixed at the first end **104** to the extension member and to the base member **32** at the second end **106** through the support post **108**. Thus, the second cylinder **102** is not stressed by any lateral movement of the arms **26**.

In an exemplary embodiment, the cover **16** is cradled by a fixed length gantry **110** which holds the cover second end **20** in place allowing the arms **26** to extend the cover over the opening **22**. A telescoping gantry may be used to enable containers of different heights to be accommodated by the truck cover system. The gantry **110** is affixed to the truck frame **12** at a point in front of where the container **21** is placed.

The container **21** is shown in an uncovered state and a covered state with the path defined by the cover **16** shown in phantom. The arms **26** transition from the first position

wherein the arms are disposed alongside the truck frame **12** and the container **21** is uncovered, to the second position wherein the arms have rotated so that the cover substantially covers the container opening **22** and the base member **34** has transitioned from a first position which is substantially parallel with the truck frame **12**, to a second position wherein the base member **34** is at an obtuse angle with respect to the truck frame **12**. The nonlinear extension member **34**, in conjunction with radial movement with respect to the base member **32**, increases the reach of the arms **26** so that a longer container may be completely covered while increasing durability of the overall truck cover system **10**.

In the first position, the first and second cylinders **94,102** are compressed. To begin the transition from the first position to the second position, the first cylinders **94** begin extending, thereby causing the base member **32** to begin to rotate about the arm pivot points **44**. Simultaneously, the second cylinders **102** extend so that the arm first ends **28** move in a substantially vertical direction until the height of the container **21** is reached by the cover **16**. The expansion of the second cylinders **102** causes axial movement of the extension members **34** with respect to the base members **32** thus increasing the length of the arms **26**. When the cover **16** attains the height of the container **21**, the second cylinders **102** contract such that the cover is maintained in close proximity to the container upper edge **22**. After the cover **16** has partially covered the container opening **22**, the second cylinders **102** expand, thereby extending the arms **26** length by causing axial movement of the extension members **34** with respect to the base members **32**. As the length of the arms **26** increase, the reach of the extension arms increase to allow the cover **16** to travel the length of the container **21**, thereby covering the container opening **22** in its entirety. The first cylinders **94** expand continuously during transition from the first position to the second position.

In an exemplary embodiment, during a transition from the first position to the second position, the cover **16** defines an arcuate motion so as to allow the cover to pass over a mound of matter within the container that rises above the container upper edge **22**. Loaded containers often have such a mound which presents a problem for a cover system where the cover moves horizontally along the container upper edge. However, many possible paths for the cover are possible with the present invention that is capable of defining many different curvatures, including a substantially horizontal path. Containers of many different heights, lengths, and widths may be accommodated without departing from the scope and spirit of the presently claimed truck cover system. Other alternative configurations of the illustrated embodiments may also be made, but still remain within the scope of the claims.

What is claimed is:

1. For a truck having a support structure and an upwardly open container with an opening defined by a container upper edge, a truck cover system securable to the support structure and capable of drawing a flexible cover having a first end and a second end over the container, the truck cover system comprising:

a pair of arms, each of said arms having a first end engaged with said support structure and a second end secured to said first end of said flexible cover, each of said arms being movable in unison from a first position to a second position, each of said arms including an elongate base member slidably engaged with an elongate extension member, said extension member of each arm being substantially parallel and noncoaxial with

respect to said base member of each arm, said first end of said flexible cover being secured to a first end of said extension member of each arm;

a first actuator associated with each of said arms, each said first actuator of each arm linking said support structure to said elongate base member of each of said arms and being actuatable to move said arms from said first position to said second position; and

a second actuator associated with each of said arms, each said second actuator of each arm linking said elongate base member with said elongate extension member of each arm and being actuatable to move said elongate extension member of each arm longitudinally with respect to said elongate base member of each arm.

2. The truck cover system according to claim **1**, wherein each of said arms further includes a slide strip disposed between said base member and said extension member of each of said arms.

3. The truck cover system according to claim **1**, wherein each of said arms further includes a first retainer affixed to a first end of said base member of each arm for retaining said base member and said extension member of each arm in slidable engagement.

4. The truck cover system according to claim **3**, wherein each said first retainer includes at least one channel formed from Ultra High Molecular Weight material for slidably confining a portion of each said extension member.

5. The truck cover system according to claim **4**, wherein each said first retainer further includes at least one back-up plate in mechanical communication with said at least one channel of each arm, wherein said at least one back-up plate impinges upon said at least one channel to adjust a tension applied to said extension member of each of said arms.

6. The truck cover system according to claim **5**, wherein said at least one channel and said at least one back-up plate are "U"-shaped and joined wherein said at least one channel and said at least one back-up plate are captive within said first retainer.

7. For a truck having a support structure and an upwardly open container with an opening defined by a container upper edge, a truck cover system securable to the support structure and capable of drawing a flexible cover having a first end and a second end over the container, the truck cover system comprising:

a pair of nonlinear arms, each of said arms having a first end engaged with said support structure and a second end secured to said first end of said flexible cover, each of said arms being movable in unison from a first position to a second position, each of said arms including an elongate base member slidably engaged with an elongate extension member, said extension member of each arm having a first elongate portion disposed at an obtuse angle with respect to a second elongate portion, said second elongate portion of said extension member of each arm being substantially parallel, noncoaxial, and in slidable engagement with said base member of each arm, and each of said first elongate portion of said extension member being secured to said first end of said flexible cover;

a first actuator associated with each of said nonlinear arms, each said first actuator of each arm linking said support structure to said elongate base member of each of said arms and being actuatable to move said arms from said first position to said second position; and

a second actuator associated with each of said nonlinear arms, each said second actuator of each arm linking

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said elongate base member with said elongate extension member of each arm and being actuatable to move said elongate extension member of each arm longitudinally with respect to said elongate base member of each arm.

8. The truck cover system of claim 7, wherein said arms define an arcuate path with respect to said container upper edge during a transition from said first position to said second position.

9. The truck cover system of claim 7, further including a gantry affixed to a truck frame and adapted for supporting said flexible cover.

10. The truck cover system of claim 9, wherein said gantry is telescopic.

11. The truck cover system of claim 7, wherein each of said arms further includes a slide strip disposed between said base member and said extension member second portion of each arm.

12. The truck cover system according to claim 7, wherein each of said arms further includes a first retainer affixed to a first end of said base member of each arm for retaining said base member and said extension member of each arm in slidable engagement.

13. The truck cover system according to claim 12, wherein said first retainer of each arm includes a plurality of channels each joined with a corresponding back-up plate, wherein said channels and a slide strip of each arm surround a part of said second portion of said extension member of each arm.

14. The truck cover system according to claim 13, wherein a tension applied to said extension member of each arm by said first retainer channels of each arm can be manipulated.

15. The truck cover system according to claim 12, wherein each of said arms further includes a second retainer affixed to said extension member of each arm for retaining said base member and said extension member of each arm in slidable engagement.

16. The truck cover system according to claim 7, wherein said support structure is in mechanical communication with a truck frame.

17. A truck container cover system, said system affixed to a truck frame by a support structure, for covering a container having an opening defined by an upper edge of the container with a flexible cover having a first end and a second end, said system comprising:

- at least one elongate, nonlinear, movable arm having a first end engaged to said support structure and a second

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end secured to said first end of said flexible cover, said at least one arm including

an elongate base member and an elongate extension member, said extension member having an elongate first portion disposed at an obtuse angle and an elongate second portion, said second portion of said extension member being in noncoaxial parallel juxtaposition with said base member wherein said extension member second portion moves axially with respect to said base member,

a slide strip disposed between said base member and said extension member second portion, and a first retainer affixed to said at least one movable arm adapted for retaining said base member and said extension member in said juxtaposition;

a first actuator associated with each said at least one arm, each said first actuator linking said support structure to said elongate base member of said arm and being actuatable to move said arm; and

a second actuator associated with each said at least one arm, each said second actuator linking said elongate base member with said elongate extension member and being actuatable to move said elongate extension member axially with respect to said elongate base member;

wherein said first and second actuators move said at least one movable arm from a position wherein said base member is substantially horizontal with respect to said truck frame, to a position wherein said base member defines an obtuse angle with respect to said position horizontal to said truck frame.

18. The truck container cover system according to claim 17, wherein an end of said at least one movable arm proximate said cover defines an arcuate path from one end of said container opening to an opposite end.

19. The truck container cover system according to claim 17, wherein said first retainer is affixed to said extension member second portion and has said base member slidably extending therethrough, said first retainer including a plurality of channels, each in mechanical communication with a corresponding back-up plate, for applying an adjustable tension to said base member.

20. The truck container cover system according to claim 17, wherein said at least one movable arm is secured to said support structure affixed to said truck frame.

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